

REMARKS

Claims 1-11 are pending in the present Application. Claim 1 is independent.

Claim Rejection – 35 U.S.C. 103; Zimmermann and Juday

Claims 1-4 and 7-11 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Zimmermann (U.S. Patent 5,185,667) in view of Juday et al. (U.S. Patent 5,067,019, hereinafter Juday). Applicants respectfully traverse this rejection.

Zimmermann does not teach at least the optical system of the present invention.

The present invention can be characterized as having distinguishing features of an optical system capable of obtaining an image of 360° view field area and capable of central projection transformation. By being capable of central projection transformation, the present invention carries out image transformations using only linear operations. By only requiring linear operations, the present invention is implemented as a simple device (i.e., is based on a look-up table 110 for a trigonometric function) that can handle a variety of transformations on the obtained image of 360° view field area. Thus, the present invention is, among other things, a combination of 1) an optical system capable of obtaining an image of 360° view field area and 2) a simple image transformation section.

The claims recite, among other things, “an optical system capable of obtaining an image of 360° view field area therearound and capable of central

projection transformation for the image.” An example of such a system is shown in Figure 2. Based on such a structure, an image obtained by the imaging section corresponds to an image seen from the internal focal point (1) of the hyperboloidal mirror.

Zimmermann’s system, on the other hand, clearly includes a fisheye lens 1. The fisheye lens produces a circular image of an entire hemispherical field-of-view, i.e., the acquired image has a field-of-view of 180 degrees (Abstract; column 3, lines 26-28; column 4, lines 28-30). The fisheye lens is not capable of obtaining an image of 360° view field area.

The Office Action alleges that “Zimmermann discloses an omniazimuthal visual system including an optical system capable of obtaining an image of 360° view field area therearound and capable of central projection transformation for the image.” The Office Action in particular directs our attention to column 4, lines 49-59. In that section, it is stated that, “the image can also be rotated through 360 degrees on its axis changing the perceived vertical of the displayed image.”

There is an apparent assumption that because the image can be rotated through 360 degrees that the optical system of Zimmermann is capable of obtaining an image of 360 degree field-of-view. In other words, there appears to be a misunderstanding of what is meant by the claimed “360° view field area.” Applicants submit that a 360° view field area for an optical system is not the same as an acquired image that can be rotated 360 degrees. The fisheye lens of Zimmermann cannot obtain an image of 360 degree field-of-view. Zimmermann

does not disclose obtaining an image of a 360-degree field-of-view. As is explicitly stated in Zimmermann, the fisheye lens provides an image of the environment with a 180-degree field-of-view. Further, in Zimmermann, all operations are limited to that image of the environment acquired through the field-of-view of the lens element. For example, Zimmermann discloses that the output image can be panned and tilted through the entire field of view of the lens element (column 4, lines 48-51). As mentioned above, Zimmermann discloses that the output image can be rotated through 360 degrees on its axis (column 4, lines 53-56). In other words, the image provided by the fisheye lens for the 180-degree field-of-view (i.e., the hemisphere) can be can be panned and tilted, and rotated through 360 degrees. The fisheye lens itself provides a 180-degree field-of-view. Rotation of an image through 360 degrees is not a 360-degree field-of-view of the optical system.

An alternative perspective as to the difference between the optical system of Zimmerman and that of the present invention is that the optical system of the present invention is capable of obtaining the contents of the environment throughout an entire sphere. On the other hand, Zimmerman discloses an optical system capable of obtaining the contents of the environment throughout a hemisphere.

In summary, it appears that Zimmerman discloses a capability of rotating an image 360 degrees, but the image was obtained from an optical system capable of obtaining an image of the environment of 180 degrees field-of-view. In other words, Zimmerman does not at all disclose an optical system capable of obtaining

an image of 360 degree field-of-view and capable of central projection transformation. Thus, at least for these reasons, Applicants submit that Zimmermann does not teach the claimed optical system.

One of ordinary skill would not be motivated to combine Zimmermann and Juday because Zimmerman involves nonlinear operations which would not be cable of processing using a look-up table.

Because the present invention includes an optical system capable of central projection transformation (a term described in detail in JP 6-295333), the present invention performs transformations using only linear operations. As disclosed in the present specification, central projection transformation is possible because an image obtained by the imaging section is one that corresponds to an image seen from an internal focal point of the hyperboloidal mirror. Thus, all transformations are linear and can be performed using a look-up table for a trigonometric function.

Because Zimmerman uses a fisheye lens, it is not cable of central projection transformation and complex mathematical operations are required in order to transform the hemispherical image into a corrected image (see col. 5, line 54, to col. 7, line 54). In particular, Zimmerman involves nonlinear operations which would not be cable of processing using a look-up table.

Juday is relied on for teaching hardware that would be applicable to the system of Zimmerman. However, even if it could be said that Juday's look-up table is comparable to that in the claimed invention, which Applicants do not concede,

Zimmerman's system could not be implemented with a look-up table because of its nonlinear operations.

Thus, Applicants submit that one of ordinary skill would not be motivated to combine Juday and Zimmerman. In addition, Juday relates to a remapper for video images and is not concerned with transformation of an image of 360-degree view field area. Accordingly, Applicants submit that Juday does not make up for the deficiencies in Zimmerman.

Following from this, Applicants submit that a person skilled in the art would not be motivated to first change the software disclosed in Zimmerman to use the specific hardware, and then secondly include the look-up table of a trigonometric function for performing coordinate transformation. Such a modification of Zimmerman could only be based on hindsight. Such picking and choosing from any one reference only so much as will support a given position, to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art is impermissible. In re Wesslau, 147 USPQ 391, 393 (CCPA 1965). Thus, Applicants submit that one of ordinary skill in the art would not be motivated to combine Zimmermann and Juday, as contended by the Examiner.

Claim Rejection - 35 U.S.C. 103; Zimmermann, Juday, Nobutoshi

Claims 5 and 6 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Zimmermann in view of Juday as applied to claim 1 above, and further in view of Nobutoshi (JP 06-295333).

Nobutoshi would not motivate one of ordinary skill to use only linear functions in Zimmermann.

Nobutoshi does appear to teach an optical system having a hyperboloid mirror, but does not teach an image transformation section that uses only linear functions and that can be implemented using a look-up table for a trigonometric function. Thus, Nobutoshi fails to make up for the deficiency of Zimmermann of using only linear functions, and in particular, capable of being implemented using a look-up table. Thus, Applicants submit that the rejection fails to establish *prima facie* obviousness.

CONCLUSION

In view of the above remarks, reconsideration of the rejections and allowance of each of claims 1-11 in connection with the above-identified application is earnestly solicited.

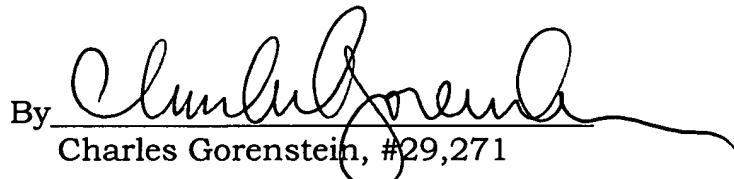
Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Robert W. Downs (Reg. No. 48,222) at the telephone number of the undersigned below, to ***arrange for an interview*** in an effort to expedite prosecution in connection with the present application.

Pursuant to 37 C.F.R. §§ 1.17 and 1.136(a), Applicant(s) respectfully petition(s) for three (3) months extension of time for filing a reply in connection with the present application, and the required fee of \$950.00 is attached hereto.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By 
Charles Gorenstein, #29,271

RWD
CG/RWD/lab.kmr

P.O. Box 747
Falls Church, VA 22040-0747
(703) 205-8000